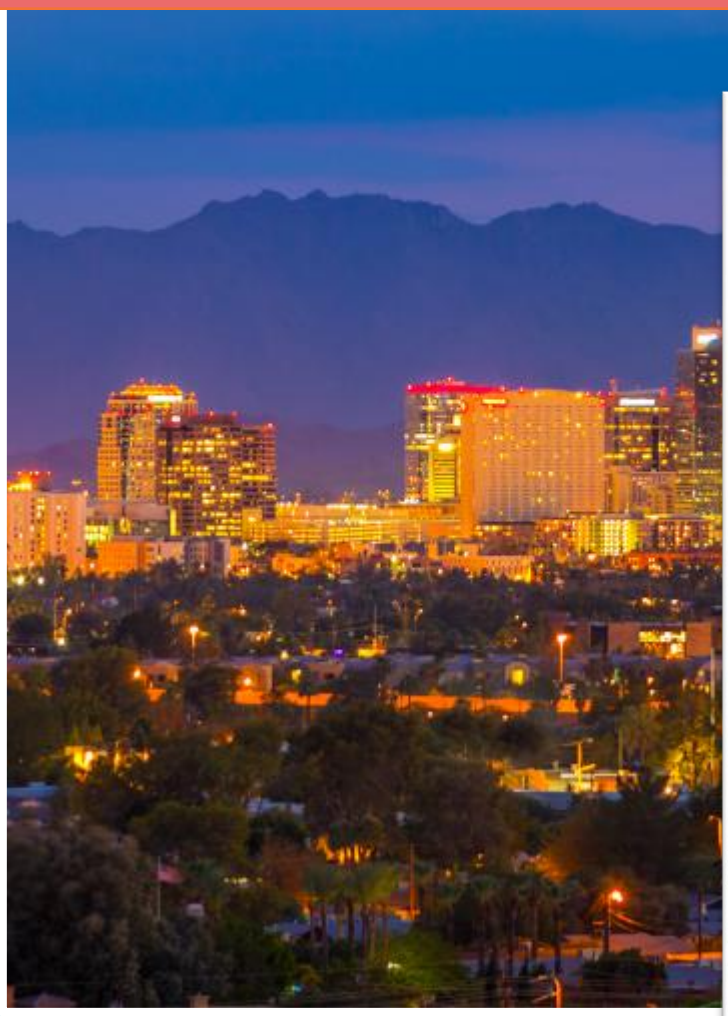
Heat-Associated Deaths in Maricopa County, AZ
Final Report for 2016



Photograph by Dan Sorensen:
http://www.dansorensenphotography.com/

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Acknowledgements

The Maricopa County Department of Public Health (MCDPH), Office of Epidemiology would like to thank the following agencies for their contributions to this report:

- Maricopa County Office of the Medical Examiner (OME)
- Maricopa County Office of Vital Registration (OVR)
- Arizona Department of Health Services (ADHS), Office of Vital Registration
- National Weather Service (NWS)
- Maricopa Association of Governments (MAG)
- Local hospitals (infection preventionists, emergency departments, social worker staff)
- City of Phoenix Heat Relief Network

Introduction

Mortality from environmental heat is a significant public health problem in Maricopa County, especially because it is largely preventable. Maricopa County has conducted heat surveillance since 2006. Each year, the enhanced heat surveillance season usually begins in May and ends in October. The main goals of heat surveillance are to identify the demographic characteristics of heat-associated deaths (e.g., age and gender) and the risk factors for mortality (e.g., homelessness). Sharing this information helps community stakeholders to design interventions in an effort to prevent heat-associated deaths among vulnerable populations.

The two main sources of data for heat surveillance are: preliminary reports of death (PRODs) from the Office of the Medical Examiner (OME) and death certificates from the MCDPH Office of Vital Registration.

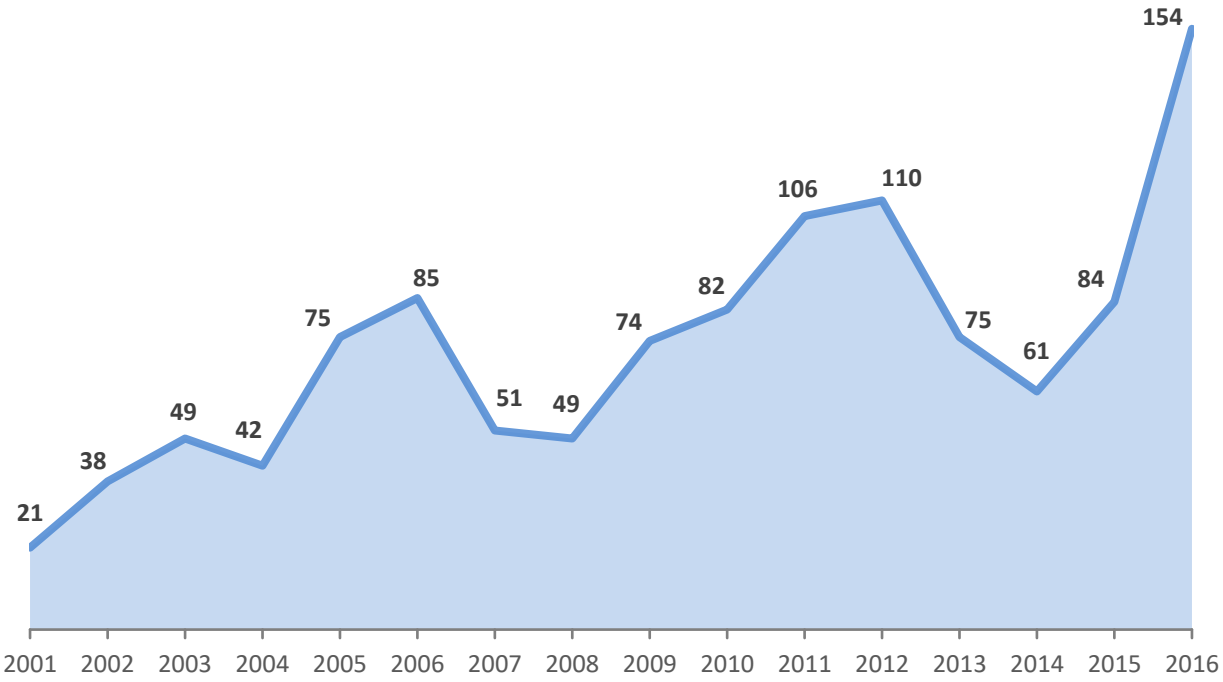
Heat-associated deaths are classified as heat-caused or heat related. Heat-caused deaths are those in which environmental heat was directly involved in the sequence of conditions causing deaths. Heat-related deaths are those in which environmental heat contributed to the deaths but was not in the sequence of conditions causing these deaths. For more information on how heat-associated deaths are classified, see the definitions in Appendix. For more information on MCDPH's surveillance system, see Background and Methodology.

Results

Heat-Associated Deaths by Year*

* Numbers include all heat-associated deaths reported to MCDPH as of 8/29/2018.

Graph 1. There were 154 heat-associated deaths reported in 2016. This was an eighty-three percent increase from the previous year.

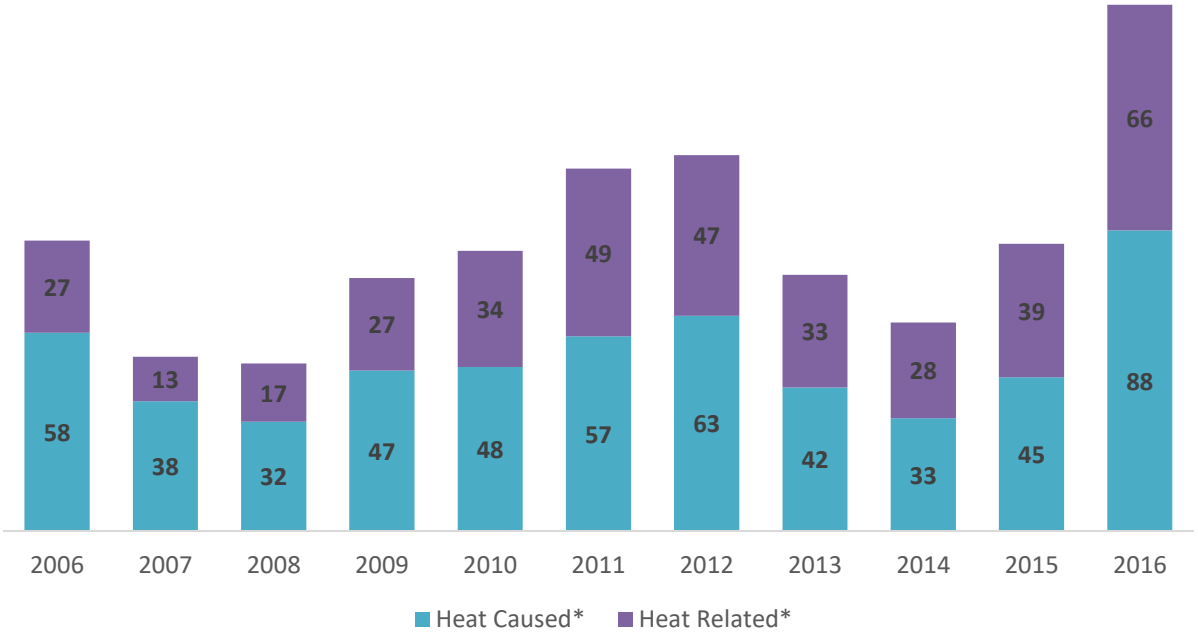


Data Sources: Maricopa County, Office of Vital Registration and Office of Medical Examiner; Arizona Department of Health Services, Office of Vital Registration

> ➢ See Methodology in the Appendix for more information about the number of confirmed, ruled-out, and pending cases by year.

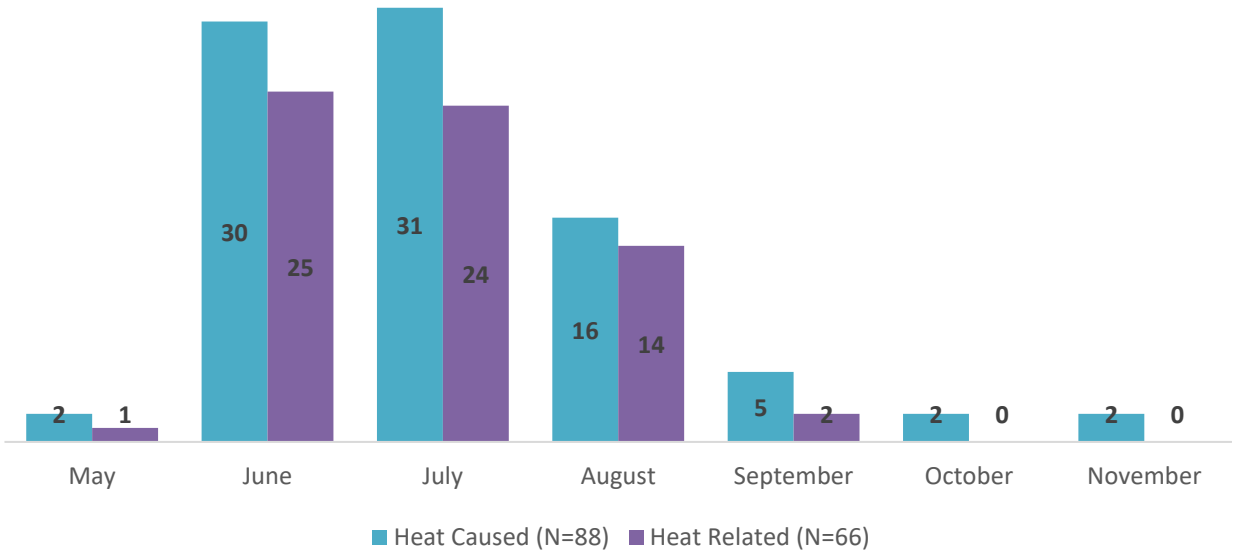
* See the Appendix for more information on the definitions of heat caused and heat related.

Graph 2. Fifty-nine percent of heat-associated deaths since 2006 have been classified as heat caused.



Heat-Associated Deaths by Month

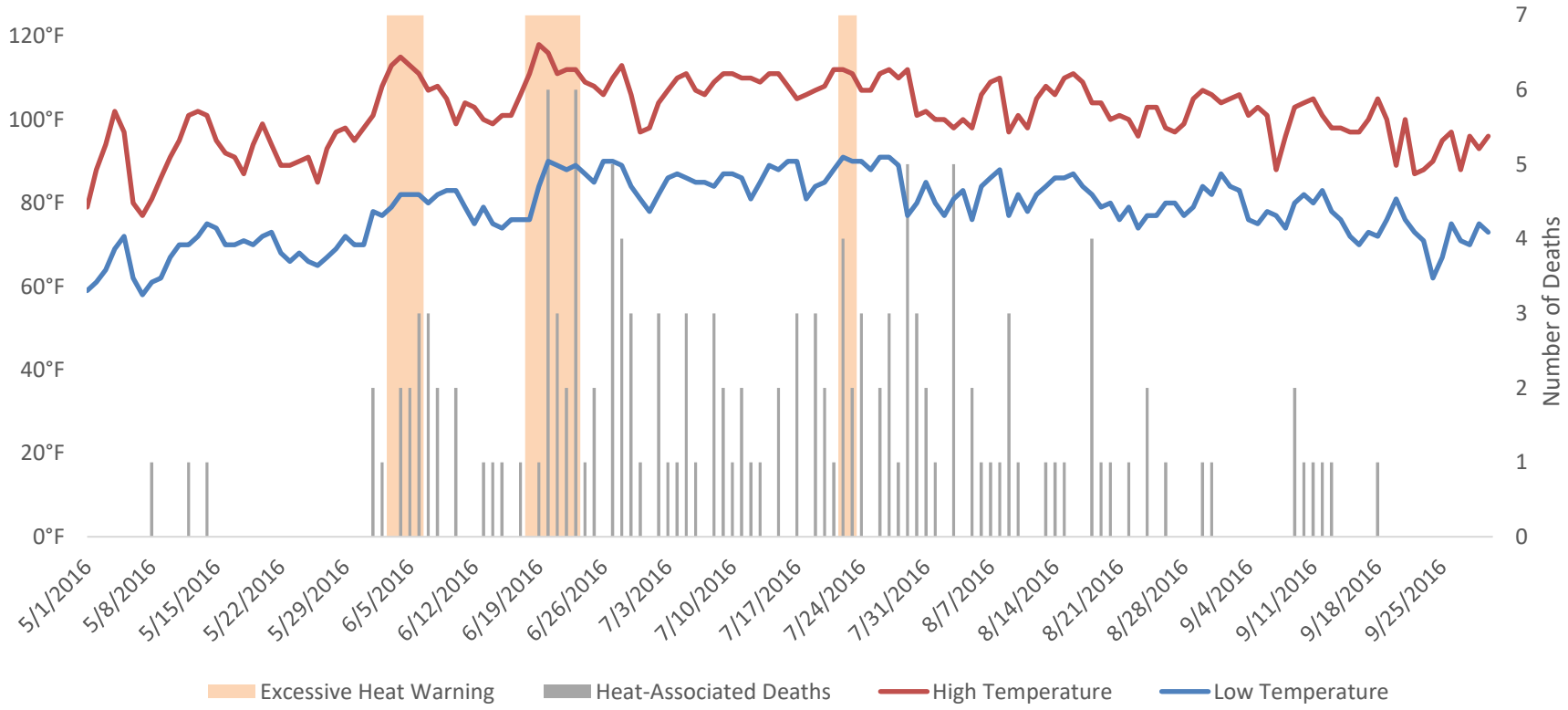
Graph 3. Ninety-one percent of all heat-associated deaths occurred in the months of June, July, and August (N=140).



Heat-Associated Deaths and Temperatures

- The National Weather Service issued three excessive heat warnings in 2016 between June 1st and July 31st for a total of twelve days.
- The highest daily maximum temperature of 2016 was 118°F and occurred on June 19th.

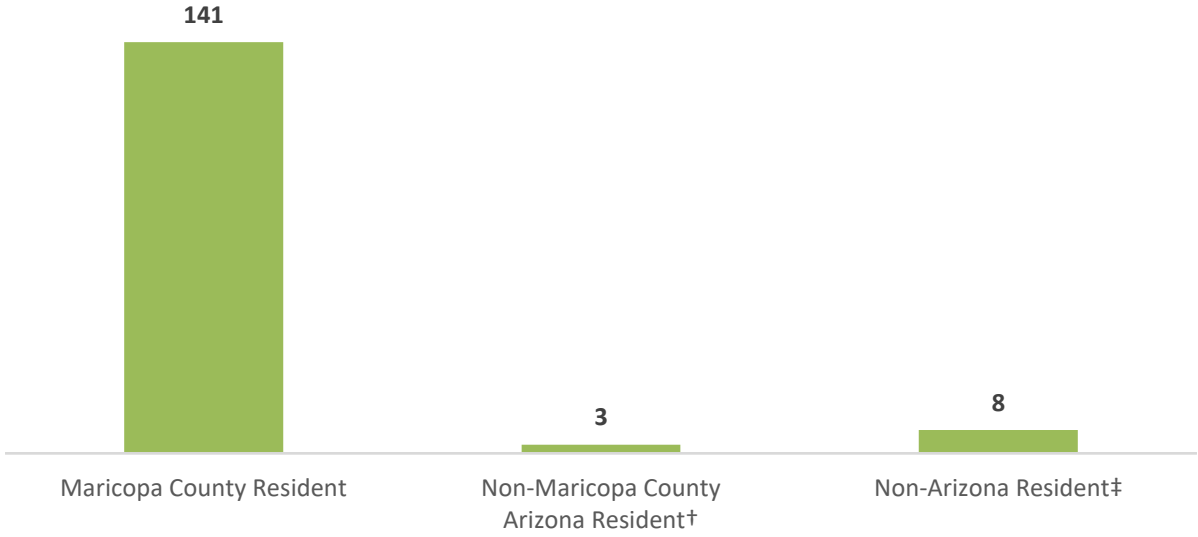
Graph 4. Twenty percent (N=31) of heat-associated deaths occurred on days for which an excessive heat warning has been issued.*



* Four deaths which occurred outside of the MCDPH enhanced heat surveillance season excluded from graph.

Heat-Associated Deaths by Residency*

Graph 5. Maricopa County residents accounted for ninety-three percent of all heat-associated deaths reported in 2016.



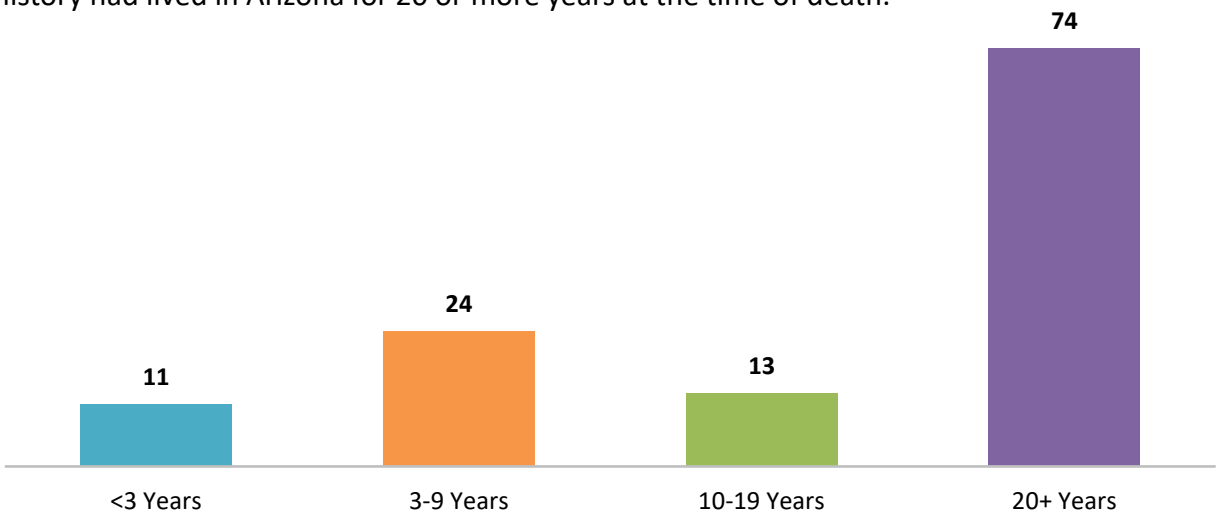
* Two cases with unknown residency status were excluded form analysis.

† Non-Maricopa County Arizona resident cases include one La Paz County resident and two Navajo County residents.

‡ Non-Arizona resident cases include five U.S. residents (California, North Carolina, New York, Washington, and Utah) and three non-U.S. residents (Mexico, Switzerland, and Great Britain).

Heat-Associated Deaths by Time Residing in Arizona*

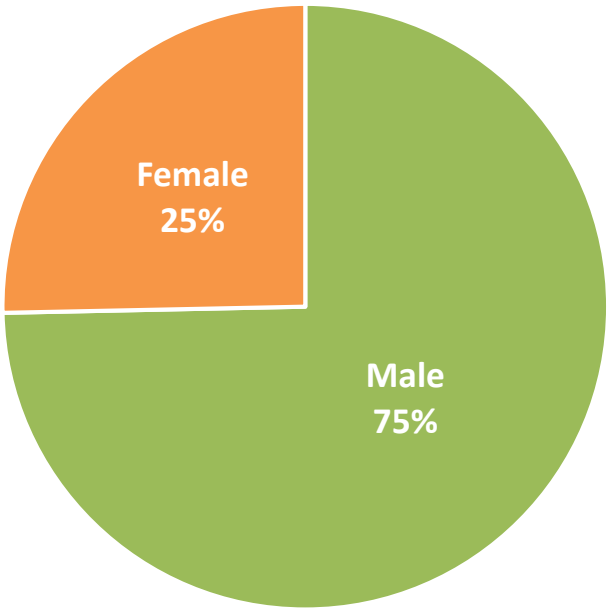
Graph 6. Sixty-one percent of heat-associated deaths with known residency history had lived in Arizona for 20 or more years at the time of death.



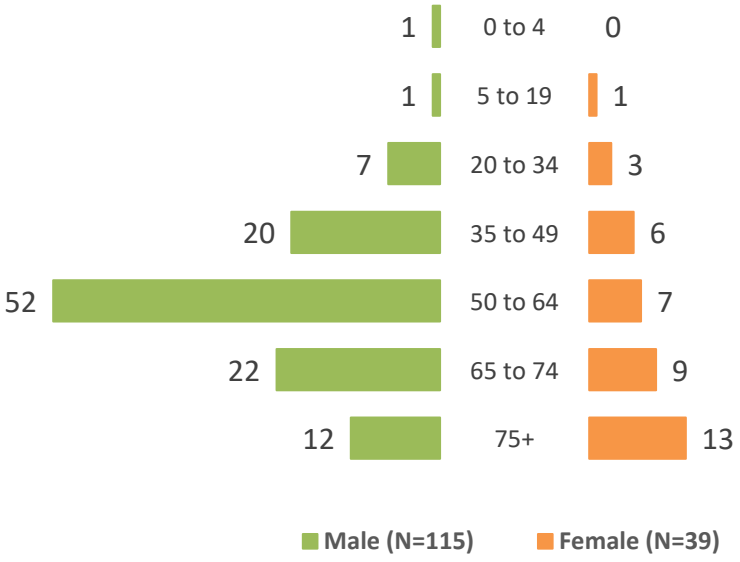
* Thirty-two cases for which time spent in Arizona was unknown were excluded from analysis.

Demographic Characteristics of Heat-Associated Deaths

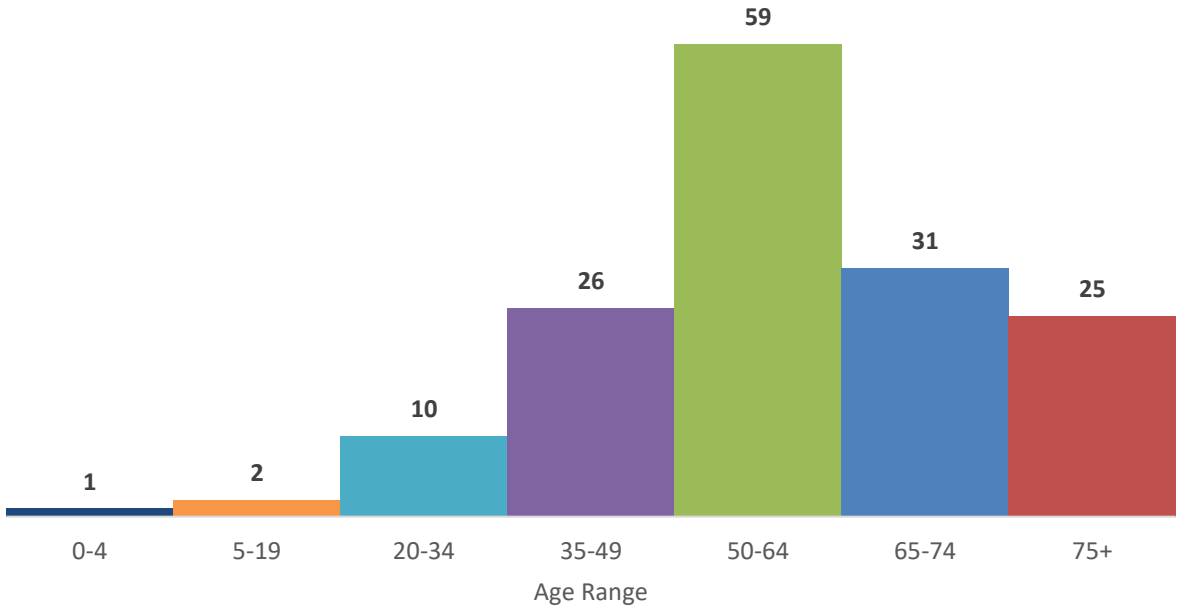
Graph 7. The majority of heat-associated deaths occurred among males.



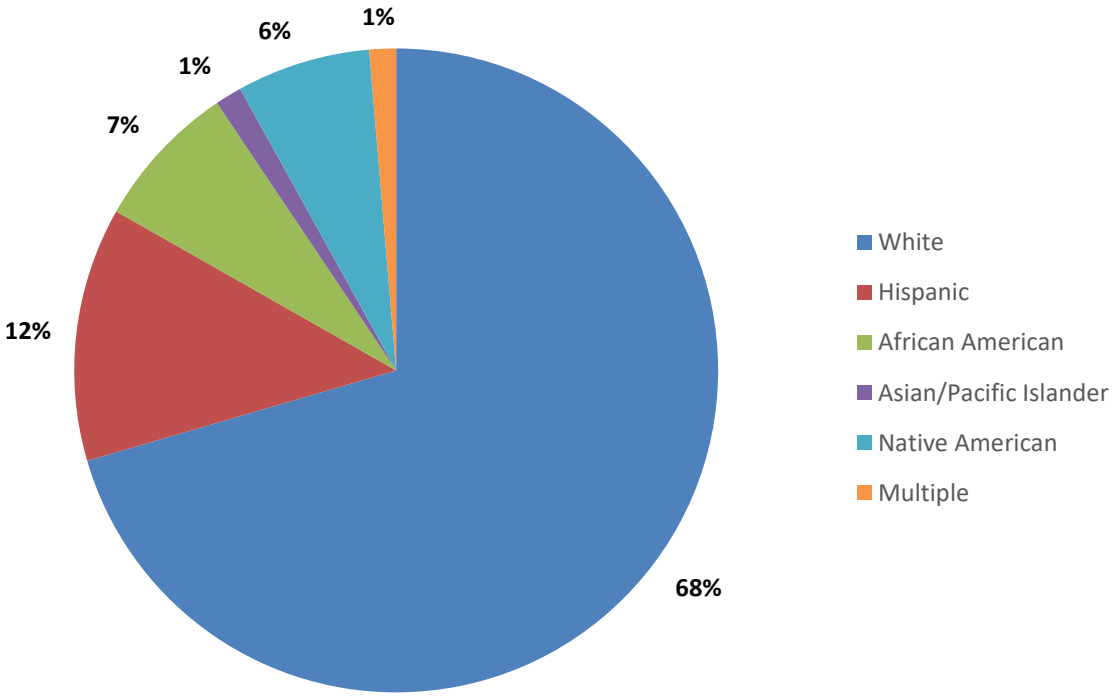
Graph 8. The largest proportion of deaths in males occurred in the 50-64 age group, while the largest proportion of deaths in females occurred in the 75+ age group.



Graph 9. Seventy-five percent (N=115) of heat-assocaited deaths were among those 50 and older.



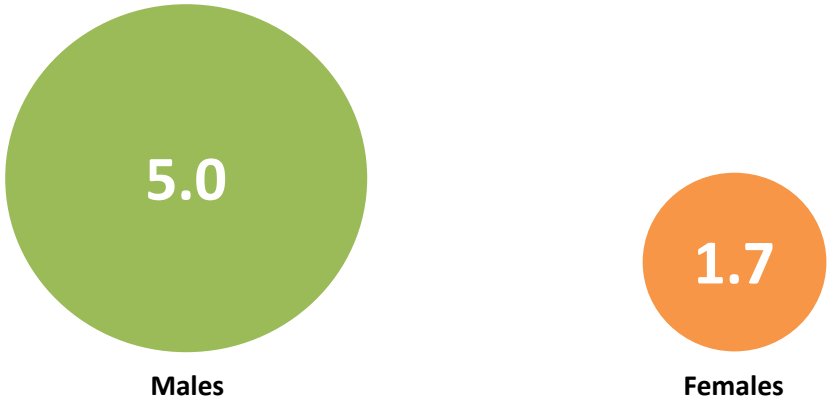
Graph 10. Sixty-eight percent (N=105) of heat-associated deaths occurred among whites.



Heat-Associated Death Rates*

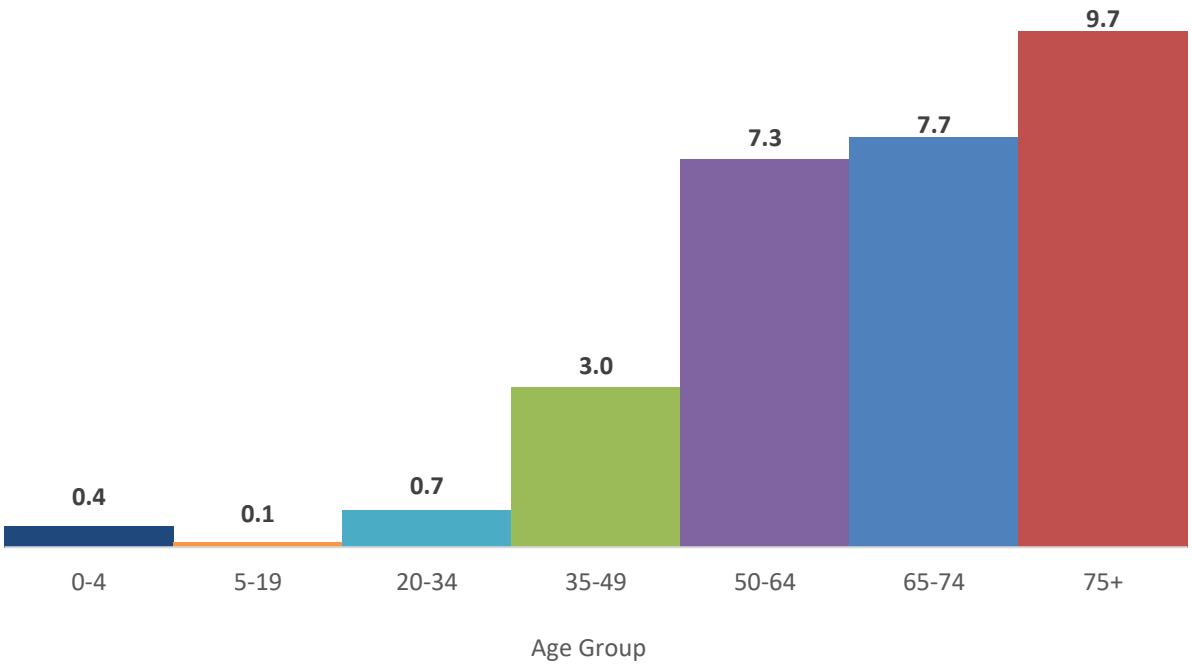
*Death rate graphs below include rates for Maricopa County residents only. Thirteen cases were excluded due to not being Maricopa County residents or for having unknown residency status. Population data used to calculate rates is based on the 2016 census population estimates.

Graph 11. The heat-associated death rate for males was almost three times greater than the death rate for females.

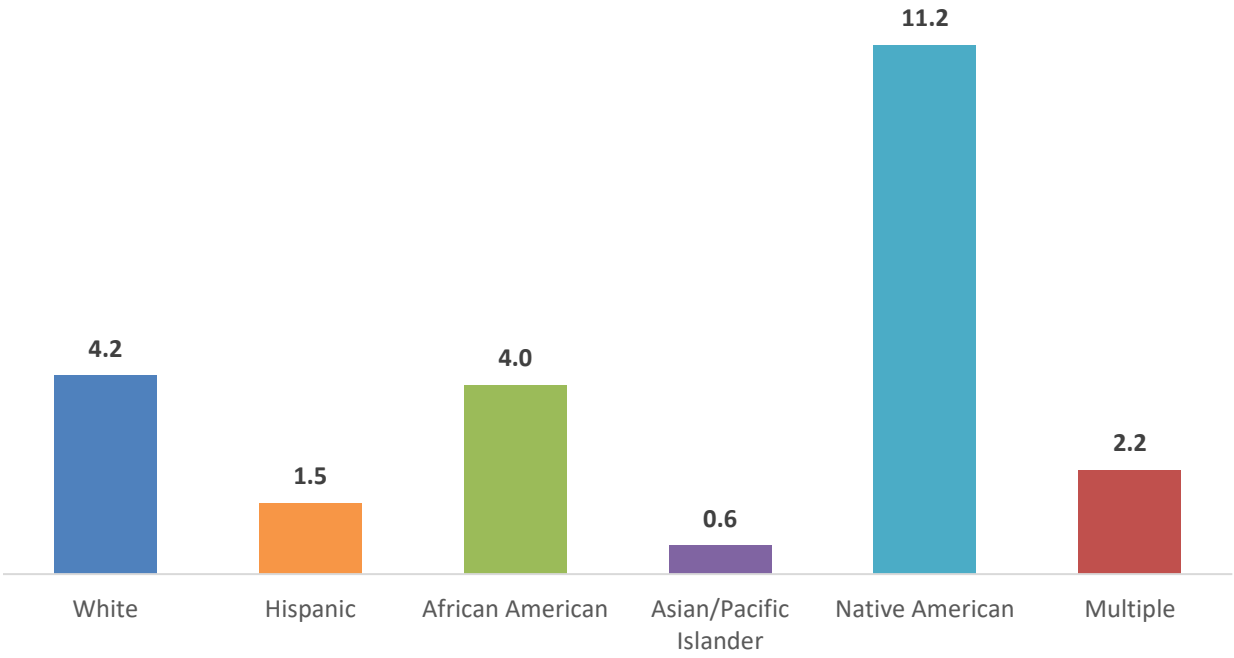


Graph 12. The heat-associated death rate was highest for males in the 50-64 age group while the rate was highest for females in the 75+ age group.

Graph 13. The heat-associated death rate increases with age.



Graph 14. Native Americans had the highest rate of heat-associated deaths.*

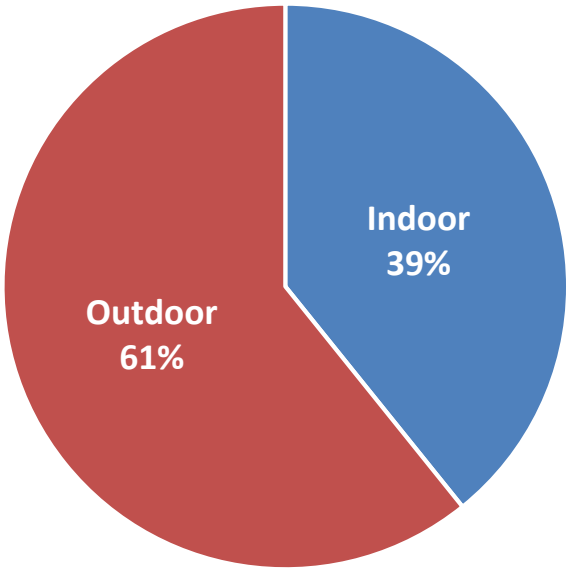


* Two cases with unknown race/ethnicity were excluded from analysis.

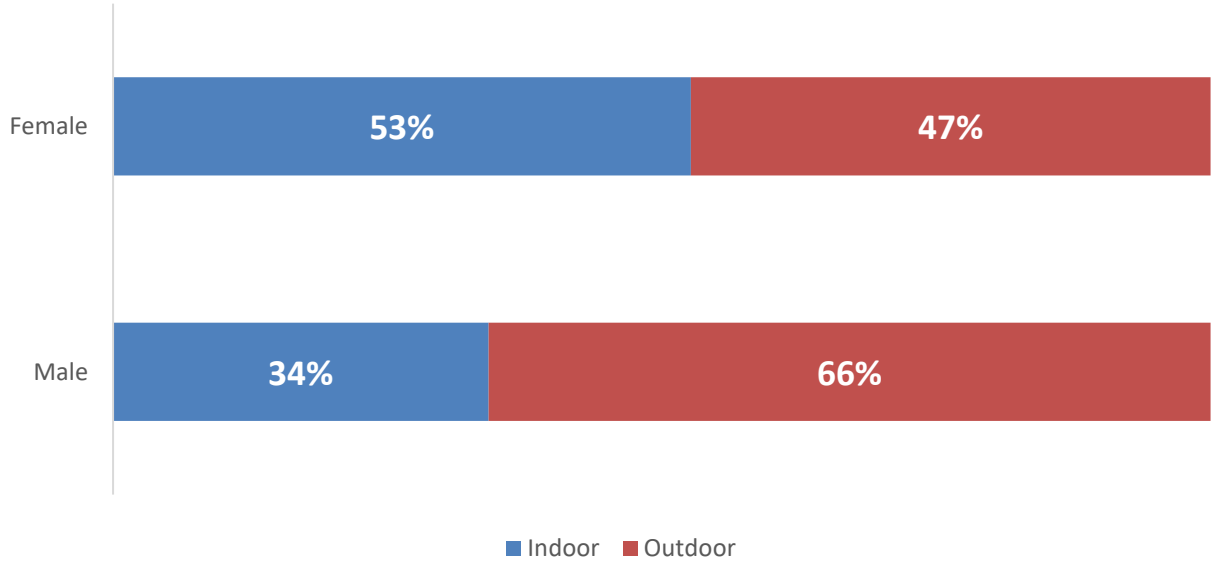
Heat-Associated Deaths by Place of Injury

* Two cases with an unknown place of injury were excluded.

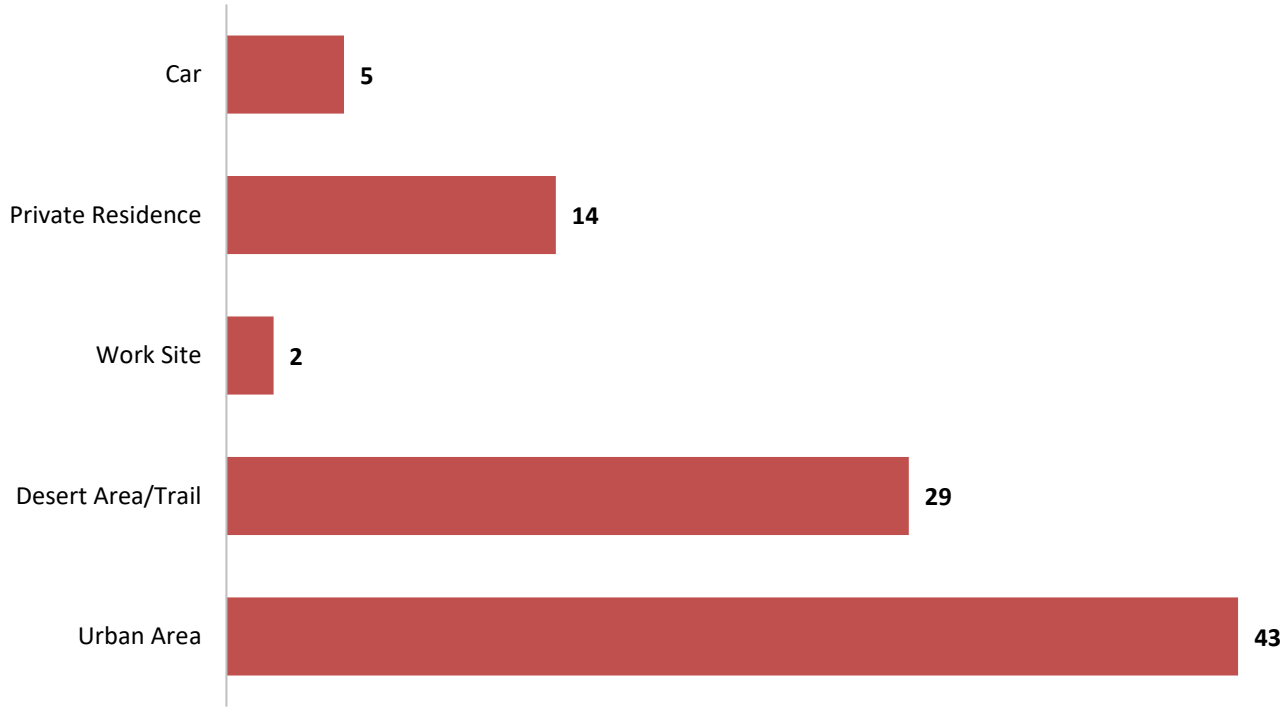
Graph 15. The majority (N=93) of all heat-associated deaths occurred outdoors.



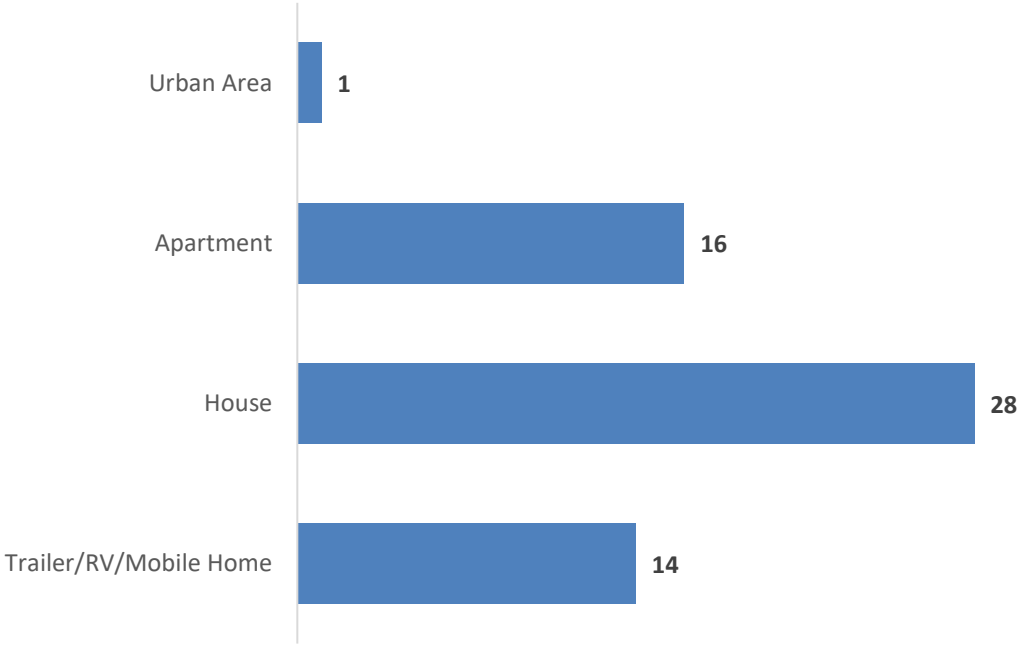
Graph 16. While the majority of male heat-associated deaths occurred outdoors (N=75), the majority of female deaths occurred indoors (N=20).



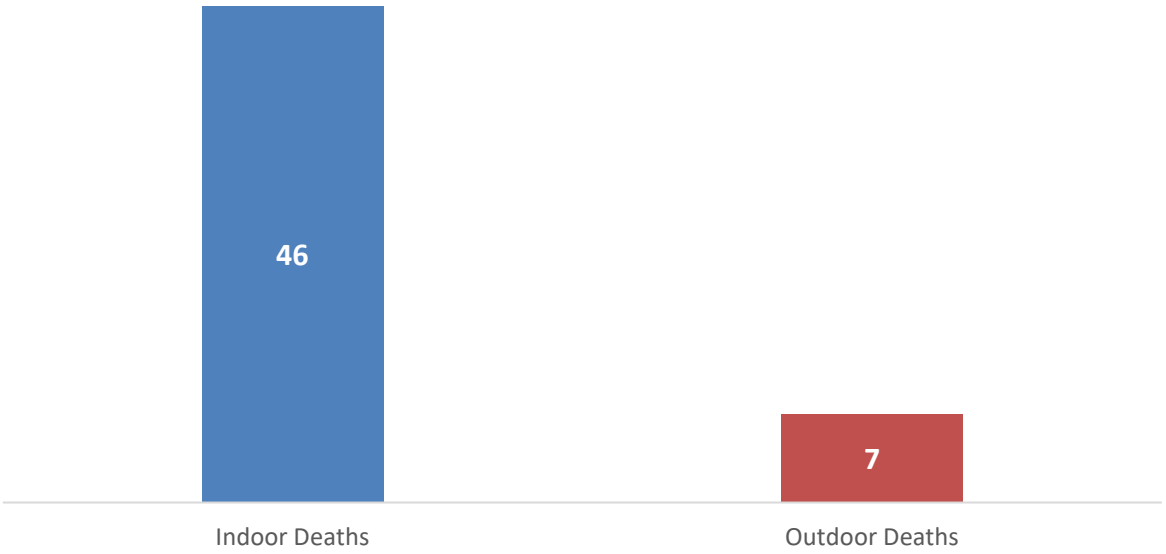
Graph 17. Forty-six percent of outdoor deaths occurred in an urban area.



Graph 18. Seventy-five percent of indoor deaths occurred in a house or apartment.



Graph 19. Seventy-eight percent of indoor deaths were discovered during a welfare check, compared to just eight percent of outdoor deaths.*

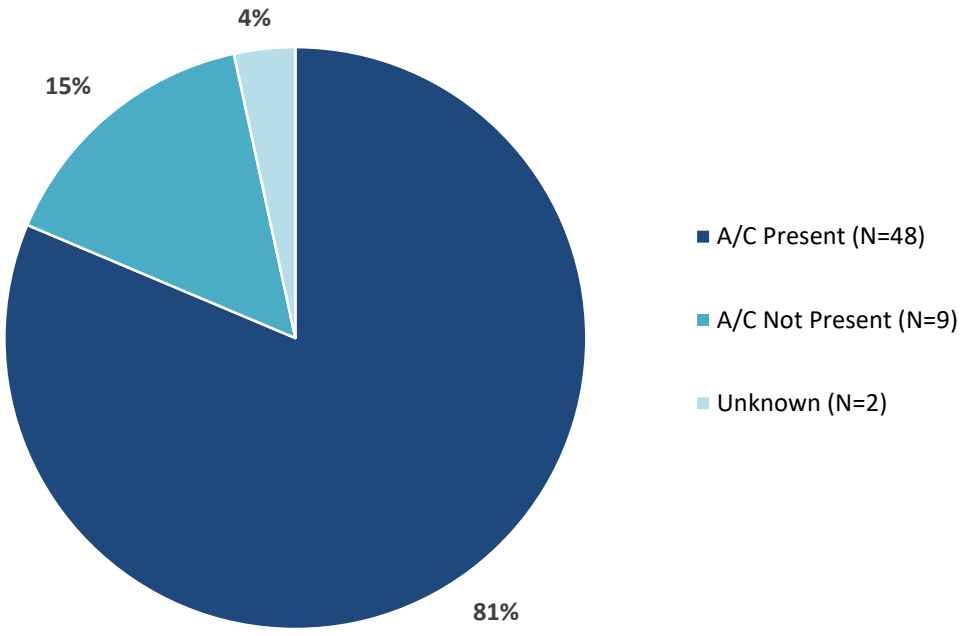


* Three cases for which welfare check information was unknown were excluded.

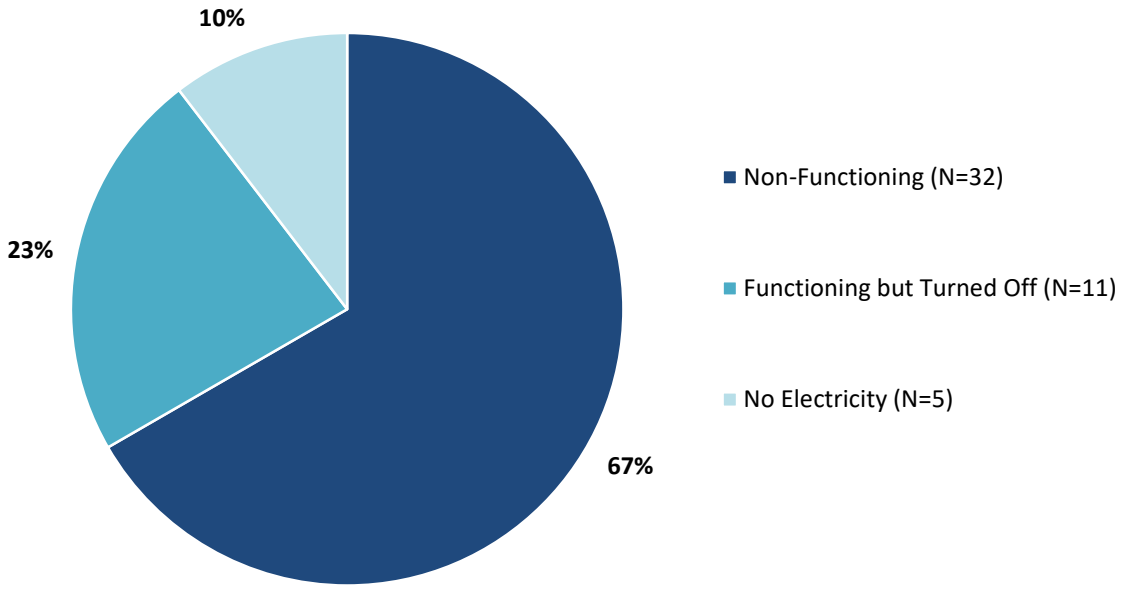
Air Conditioning Use for Indoor Deaths*

* Evaporative coolers were not considered as A/C units as their ability to cool becomes inadequate in extreme Maricopa County temperatures.

Graph 20. Eighty-one percent of indoor deaths had an air conditioning unit present at time of death.



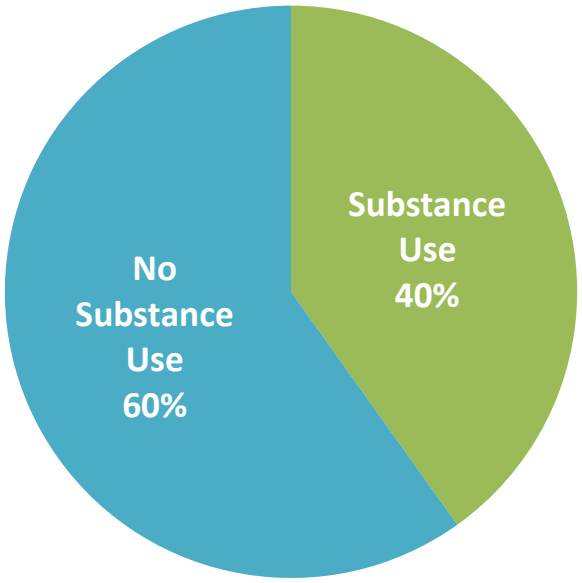
Graph 21. Among indoor deaths where an A/C unit was present, a non-functioning A/C unit was the most common reason for not having a cooled environment at the time of death.



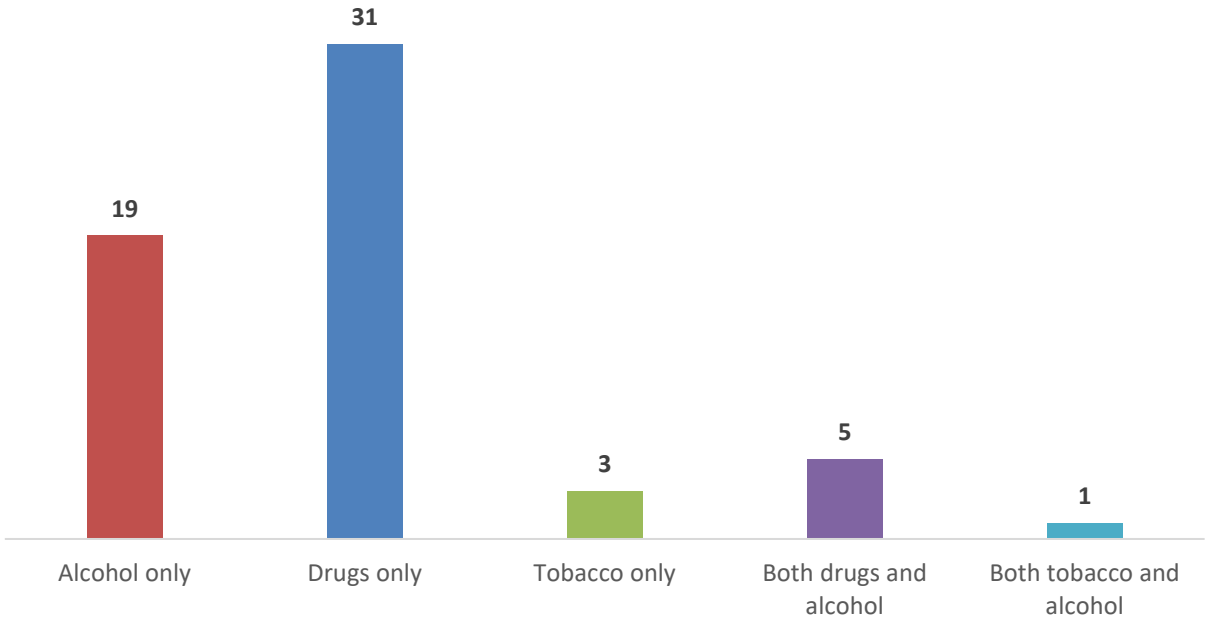
Substance Use among Heat-Associated Deaths*

* Substance use refers to evidence of drug, alcohol, or tobacco use at time of death. Two cases with unknown substance use were excluded from analysis.

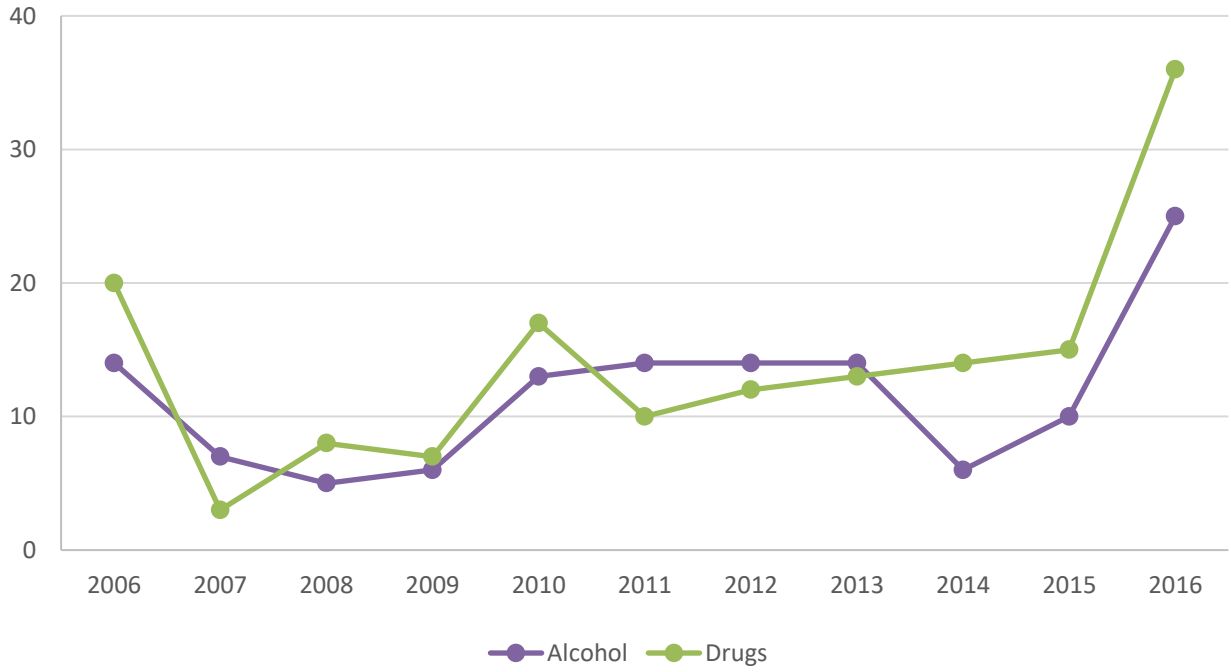
Graph 22. Forty percent of cases (N=61) involved substance use at time of death.



Graph 23. Twenty-three percent of cases (N=36) involved drug use at time of death.



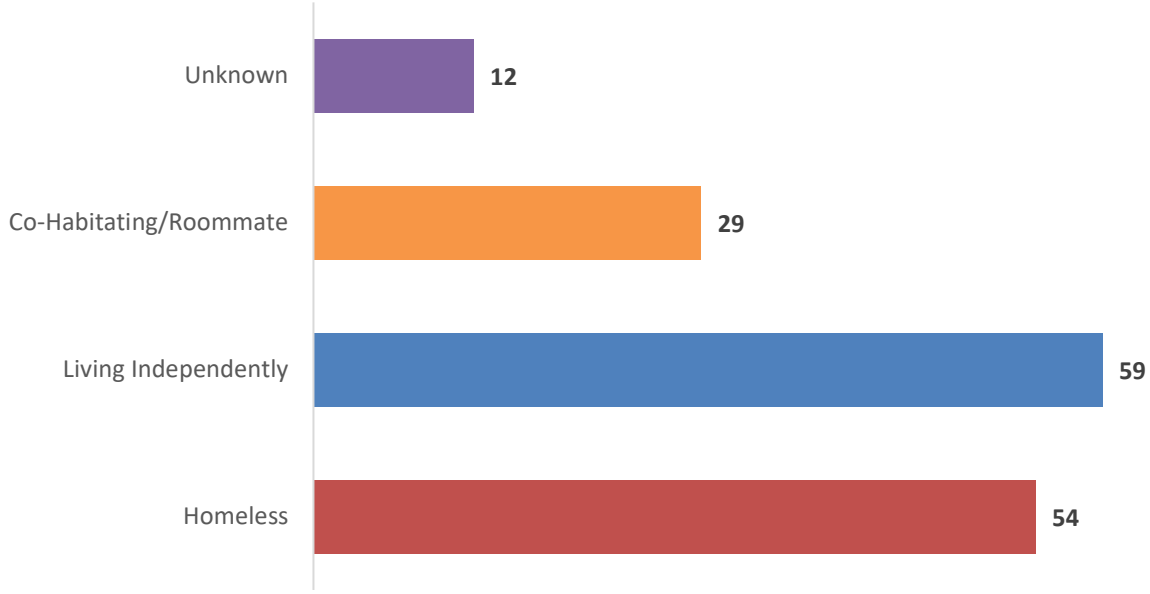
Graph 24. The number of heat-associated deaths involving drug use increased one hundred and fourty percent from the previous year.



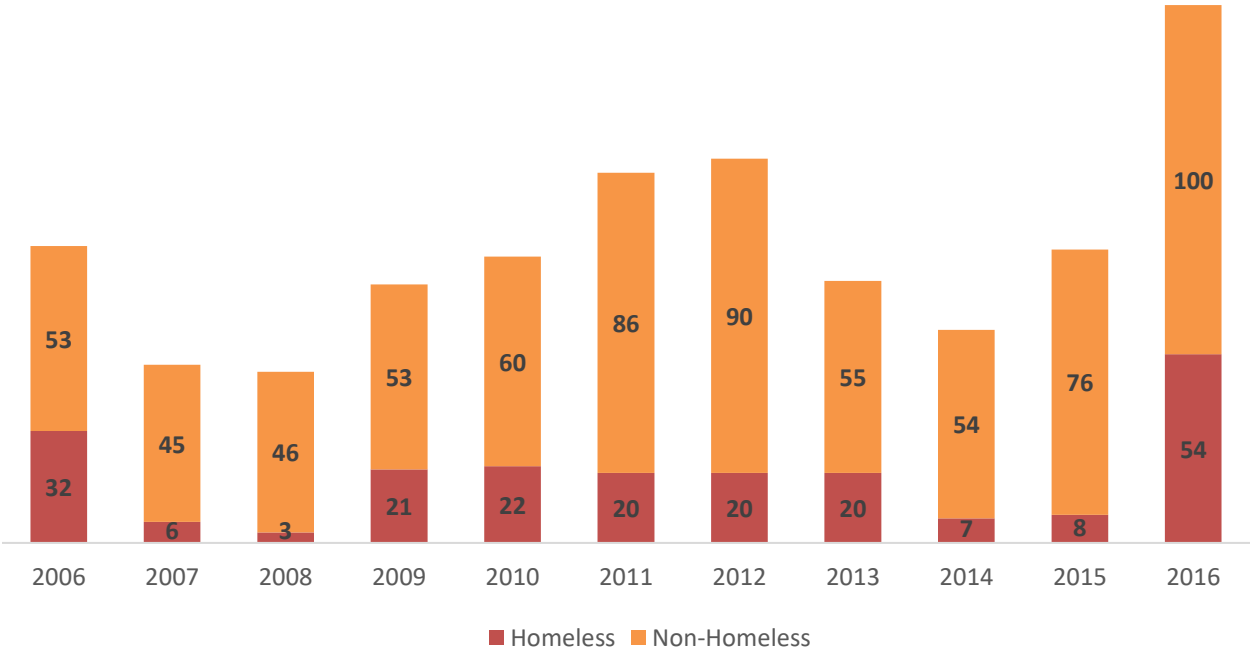
* Cases involving both drug and alcohol use are represented on both lines.

Living Situation among Heat-Associated Deaths

Graph 25. Thirty-five percent of cases were homeless at time of death.



Graph 26. More heat-associated deaths occurred among homeless individuals than any previous year on record.



Conclusions

- There were 83% more heat-associated deaths in 2016 compared to 2015.
- Three excessive heat warnings were issued in the summer of 2016, and ranged in duration from 2 to 6 days. On those days, 20% of the heat associated deaths occurred.
- Most of the deaths occurred in the months of June, July, and August.
- There were more heat-caused deaths than heat-related deaths.
- The majority of cases were residents of Maricopa County. Furthermore, most cases had lived in Arizona for 20 years or more.
- Overall, there were much fewer deaths among females than among males
- Among Maricopa County residents, the rate of heat-associated deaths was the highest for males, Native Americans, and those 75 years of age or older.
- The majority of cases were injured outdoors. The most common place of injury for the outdoor deaths was an urban area. The most common place of injury for indoor deaths was at a private residence.
- While 81% of indoor deaths had an A/C unit present at the time of death, in all cases the environment was not being adequately cooled. Reasons for lack of cooling in the presence of an A/C unit include a malfunctioning unit, a lack of electricity, the unit being turned off due to cost, forgetfulness, or other reasons, and the unit being set to a high temperature. A total of 15% of indoor cases did not have an A/C unit present.
- Drugs, tobacco, or alcohol were mentioned in the death certificate for 40% of cases.
- Homeless individuals accounted for 35% of heat-associated deaths.
- The average years of life lost for those with heat-related deaths was 22.6 years with 57 years old being the median age of death.

Appendix

Background

In July 2005, Maricopa County (MC) experienced exceptionally high temperatures that contributed to 45 deaths, of which 35 occurred over nine consecutive days. Temperatures reached 116° F and three excessive heat warnings were issued during this month. After this event, the Maricopa County Department of Public Health (MCDPH) created a novel and effective approach for surveillance of heat-associated deaths in 2006 and has continued to use this system annually.

Methodology

Surveillance data is obtained from the following sources:

1. The Maricopa County Office of the Medical Examiner (OME) forwards suspected heat-related deaths to MCDPH and provides data including demographics, preliminary information regarding how the death occurred, and the circumstances of death. In the past, this information came solely as a weekly line list with limited information for each case. However, in February of 2012, MCDPH started receiving all preliminary reports of death (PRODs) from the OME. These reports provide expanded information on a daily basis and have changed the screening methods used by MCDPH staff to ensure that all potential heat-related deaths are documented.

2. The MCDPH Office of Vital Registration registers all Maricopa County death certificates in the Arizona Department of Health Services vital records database. The MCDPH Office of Epidemiology searches this database looking for causes of death associated with environmental heat. A Statistical Analysis Software (SAS) program looks for the key phrases and International Classification of Disease-10 (ICD-10) codes listed below.

Key Phrases
HEAT EXPOSURE
ENVIRON
EXHAUSTION
SUN
HEAT STRESS
HEAT STROKE
HYPERTHERMIA

ICD 10 Code	Corresponding Definition
X30	Exposure to excessive natural heat
T67.X	Effects of heat and light
P810	Environmental hyperthermia of newborn

3. Hospital and media reports can sometimes initiate a heat death investigation, for example, if a child is reportedly left in a hot car.

Once data are received, analysis of the information is required to identify only those deaths caused as a result of environmental heat. Environmental heat is heat generated by the climate (sun, humidity, etc.) rather than heat from man-made sources such as ovens or manufacturing equipment. Heat-associated deaths are categorized based on the classification criteria listed below:

Heat-caused (HC) deaths are those in which environmental heat was directly involved in the sequence of conditions causing deaths. These are deaths where environmental heat terms were indicated in ***Part I***[1] of the death certificate causes of death (diseases or conditions in the direct sequence causing death), for cause of death variables (*cod_a, cod_b, cod_c, or cod_d).* County of death: Maricopa.

Heat-related (HR) deaths are those in which environmental heat contributed to the deaths but was not in the sequence of conditions causing these deaths. These are cases where environmental heat terms were mentioned in ***Part II***[2] of the death certificate causes of death (diseases and conditions contributing but not directly resulting in the death sequence), but not in any of the Part I death variables (*cod_a, cod_b, cod_c, or cod_d*). County of death: Maricopa.

For the purposes of this report, heat-caused and heat-related deaths are combined and referred to as "heat-associated deaths." Please note that most jurisdictions report only heat-caused deaths. This should be considered when comparing Maricopa County data with data from other locations.

Death certificate data, in combination with the OME notes, are used to produce the information that is contained in this report. Total case count, demographics, residency, drug/alcohol use, and years lived in Arizona are directly retrieved from death certificate data. Place of death location, indoor/outdoor occurrence, air conditioning use, and homelessness are retrieved based on explicit notations made in the death certificate and/or OME notes. For the purposes of this report, reasons for not having a cooled environment at the time of death in indoor cases where an A/C unit was present were grouped into three categories: non-functioning, functioning but turned off, and no electricity. "Non-functioning" is defined as an A/C unit that was not operating properly, was broken, or could not be turned on despite the presence of electricity. Cases categorized as having a "functioning but turned off" A/C unit indicate that the unit worked properly but was the A/C was turned off for some reason at the time of the OME scene inspection. In cases where the unit could not be turned on due to a lack of electricity, regardless of whether it was functioning or non-functioning, were counted in the "no electricity" category.

Homelessness is defined as having an address on the death certificate that matches a homeless shelter, government agency, business, or an intersection. Cases are also classified as homeless if there is an indication on the death certificate. If the address is listed as unknown on the death certificate then an examination of the medical examiner's notes is made to determine if there is a reference to an address - if none, then the person is classified as homeless. If the address is listed as out of jurisdiction then time spent in Arizona, as provided by the death certificate, is taken into consideration.

Once classification is completed, the data are summarized for the production and dissemination of reports. Reports are generated weekly during the season and posted to the MCDPH website which can be found at: http://www.maricopa.gov/publichealth/Services/EPI/Reports/heat.aspx

[1] **Part I of the death certificate:** cod a – is the immediate cause (final disease or condition resulting in death) cod b, cod c, cod d – are sequentially listed conditions leading to the cause listed on cod a.

[2] **Part II of the death certificate:** Other significant conditions contributing to death but not resulting in the underlying cause given in Part I.

Tables

Table A. Heat-Associated Deaths Reported by Investigation Status, Maricopa County, 2006-2016

YEAR	TOTAL CASES REPORTED	CONFIRMED CASES (%)	RULED-OUT CASES (%)	PENDING CASES (%)
2006	104	85 (82%)	19 (18%)	0 (0%)
2007	131	51 (39%)	80 (61%)	0 (0%)
2008	97	49 (51%)	48 (49%)	0 (0%)
2009	114	74 (65%)	40 (35%)	0 (0%)
2010	142	82 (58%)	60 (42%)	0 (0%)
2011	144	106 (74%)	38 (26%)	0 (0%)
2012	173	110 (64%)	63 (36%)	0 (0%)
2013	145	75 (52%)	70 (48%)	0 (0%)
2014	115	61 (53%)	54 (47%)	0 (0%)
2015	144	84 (58%)	59 (42%)	0 (0%)
2016	240	154 (64%)	86 (36%)	0 (0%)
Total	**1,549**	**931 (60%)**	**617 (40%)**	**0 (0%)**

Table B. Heat-Associated Deaths by Gender and Age Group, Maricopa County, 2016

AGE GROUP	MALE CASES (%)	FEMALE CASES (%)	TOTAL CASES (%)
0-4	1 (1%)	0 (0%)	1 (1%)
5-19	1 (1%)	1 (3%)	2 (1%)
20-34	7 (6%)	3 (8%)	10 (6%)
35-49	20 (17%)	6 (15%)	26 (17%)
50-64	52 (45%)	7 (18%)	59 (38%)
65-74	22 (19%)	9 (23%)	31 (20%)
75+	12 (10%)	13 (33%)	25 (16%)
TOTAL	**115 (100%)**	**39 (100%)**	**154 (100%)**

Table C. Heat-Associated Deaths Rates per 100,000 Residents* by Gender and Age Group, Maricopa County, 2016

AGE GROUP	MALE RATE (N)	FEMALE RATE (N)	TOTAL RATE (N)
0-4	0.7 (1)	0.0 (0)	0.4 (1)
5-19	0.2 (1)	0.0 (0)	0.1 (1)
20-34	0.9 (4)	0.5 (2)	0.7 (6)
35-49	4.6 (19)	1.4 (6)	3.0 (25)
50-64	13.3 (48)	1.8 (7)	7.3 (55)
65-74	11.9 (20)	4.1 (8)	7.7 (28)
75+	10.8 (12)	8.9 (13)	9.7 (25)
All Ages	**5.0 (105)**	**1.7 (36)**	**3.3 (141)**

* Based on 2016 census population estimates for Maricopa County. Thirteen cases that were not Maricopa County residents or for which residence was unknown excluded.

Table D. Heat-Associated Deaths Rates per 100,000 Residents* by Age Group and Race/Ethnicity, Maricopa County, 2016

	AGE GROUP RATE (N)							
RACE/ETHNICITY	**0-4**	**5-19**	**20-34**	**35-49**	**50-64**	**65-74**	**75+**	**TOTAL**
White	0.0 (0)	0.3 (1)	0.9 (4)	3.3 (15)	7.5 (39)	7.2 (21)	8.7 (19)	4.2 (99)
Hispanic	0.8 (1)	0.0 (0)	0.3 (1)	0.4 (1)	6.6 (10)	4.6 (2)	17.0 (4)	1.5 (19)
Black	0.0 (0)	0.0 (0)	1.8 (1)	6.6 (3)	5.6 (2)	8.1 (1)	31.1 (2)	4.0 (9)
Asian/Pacific Islander	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	3.5 (1)	0.0 (0)	0.0 (0)	0.6 (1)
Native American	0.0 (0)	0.0 (0)	0.0 (0)	20.8 (3)	31.7 (3)	70.0 (2)	0.0 (0)	11.2 (8)
Multiple	0.0 (0)	0.0 (0)	0.0 (0)	8.3 (1)	0.0 (0)	44.5 (1)	0.0 (0)	2.2 (2)
Total	**0.4 (1)**	**0.1 (1)**	**0.7 (6)**	**3.0 (25)**	**7.5 (56)**	**7.7 (28)**	**9.7 (25)**	**3.3 (141)**

* Based on 2016 census population estimates for Maricopa County. Thirteen cases that were not Maricopa County residents or for which residence was unknown excluded. Total includes three cases of unknown race/ethnicity.

Table E. Heat-Associated Deaths Rates per 100,000 Residents* by Gender and Race/Ethnicity, Maricopa County, 2016

RACE/ETHNICITY	**MALE RATE (N)**	**FEMALE RATE (N)**	**TOTAL RATE (N)**
White	5.9 (69)	2.5 (30)	4.2 (99)
Hispanic	2.5 (16)	0.5 (3)	1.5 (19)
Black	5.3 (6)	2.7 (3)	4.0 (9)
Asian/Pacific Islander	1.2 (1)	0.0 (0)	0.6 (1)
Native American	23.9 (8)	0.0 (0)	11.2 (8)
Multiple	4.5 (2)	0.0 (0)	2.2 (2)
Total	**5.0 (105)**	**1.7 (36)**	**3.3 (141)**

* Based on 2016 census population estimates for Maricopa County. Thirteen cases that were not Maricopa County residents or for which residence was unknown excluded. Total includes three cases of unknown race/ethnicity.

Table F. Indoor Heat-Associated Deaths by Place of Injury and Age Group, Maricopa County, 2016

AGE GROUP	HOUSE	APARTMENT	TRAILER/RV/ MOBILE HOME	URBAN AREA	TOTAL
0-4	0	0	0	0	0
5-19	0	0	0	0	0
20-34	0	0	0	0	0
35-49	1	2	1	0	4
50-64	14	3	8	1	26
65-74	7	5	2	0	14
75+	6	6	3	0	15
Total	**28**	**16**	**14**	**1**	**59**

Table G. Outdoor Heat-Associated Deaths by Place of Injury and Age Group, Maricopa County, 2016

AGE GROUP	CAR	DESERT AREA	RESIDENCE	URBAN AREA	WORK SITE	TOTAL
0-4	1	0	0	0	0	1
5-19	0	2	0	0	0	2
20-34	0	6	0	3	0	9
35-49	1	11	0	10	0	22
50-64	2	7	4	17	2	32
65-74	1	1	5	10	0	17
75+	0	2	5	3	0	10
Total	**5**	**29**	**14**	**43**	**2**	**93**

Table H. Heat-Associated Deaths by Place of Injury, Age Group, and Gender, Maricopa County, 2016

	INDOOR			OUTDOOR		
AGE GROUP	**MALE**	**FEMALE**	**TOTAL**	**MALE**	**FEMALE**	**TOTAL**
0-4	0	0	0	1	0	1
5-19	0	0	0	1	1	2
20-34	0	0	0	7	2	9
35-49	2	2	4	18	4	22
50-64	22	4	26	29	3	32
65-74	9	5	14	13	4	17
75+	6	9	15	6	4	10
Total	**39**	**20**	**59**	**75**	**18**	**93**

Table I. Indoor Heat-Associated Deaths by Presence of an Air Conditioning (A/C) Unit and Age Group, Maricopa County, 2016

AGE GROUP	**A/C UNIT PRESENT**	**A/C UNIT NOT PRESENT OR UNKNOWN**	**TOTAL**
0-4	0	0	0
5-19	0	0	0
20-34	0	0	0
35-49	4	0	4
50-64	16	10	26
65-74	14	0	14
75+	14	1	15
Total	**48**	**11**	**59**

Table J. Indoor Heat-Associated Deaths by Air Conditioning (A/C) Status and Age Group, Maricopa County, 2016

AGE GROUP	NO ELECTRICITY	NON-FUNCTIONING	NOT IN USE	NOT AVAILABLE	OTHER	UNKNOWN	TOTAL
0-4	0	0	0	0	0	0	0
5-19	0	0	0	0	0	0	0
20-34	0	0	0	0	0	0	0
35-49	0	4	0	0	0	0	4
50-64	2	13	1	8	0	1	26
65-74	1	8	5	0	0	1	14
75+	2	7	4	1	1	0	15
Total	**5**	**32**	**10**	**9**	**1**	**2**	**59**

Table K. Heat-Associated Deaths by Substance Use at Time of Death, Maricopa County, 2016

AGE GROUP	ALCOHOL USE	DRUG USE	TOBACCO USE
0-4	0	0	0
5-19	0	0	0
20-34	2	2	0
35-49	3	15	0
50-64	17	19	1
65-74	5	0	2
75+	0	0	1
Total	**27**	**36**	4

* Cases with more than one substance in use at time of death are included in each relevant column.

Table L. Heat-Associated Deaths among Homeless Individuals, Maricopa County, 2016

AGE GROUP	MALE (%)	FEMALE (%)	TOTAL (%)
0-4	0 (0%)	0 (0%)	0 (0%)
5-19	0 (0%)	0 (0%)	0 (0%)
20-34	5 (9%)	2 (4%)	7 (13%)
35-49	15 (27%)	2 (4%)	17 (31%)
50-64	22 (40%)	2 (4%)	24 (44%)
65-74	6 (11%)	0 (0%)	6 (11%)
75+	0 (0%)	0 (0%)	0 (0%)
Total	**48 (89%)**	**6 (11%)**	**54 (100%)**

Poster

Poster 1. The Effects of Maximum and Minimum Temperatures on Deaths Attributed to Environmental Heat in Maricopa County, 2006-2013

#5351

The Effects of Maximum and Minimum Temperatures on Deaths Attributed to Environmental Heat in Maricopa County, 2006-2013

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INTRODUCTION

Officially, enhanced heat surveillance begins in May and continues through October of each year. Environmental heat-associated deaths (HA) in Maricopa County (MC) are highest during the months of June, July, and August. During this period, the temperatures range from 92-118 °F for maximum daytime temperature, and 71-96 °F for nighttime temperature. Prolonged exposure to the combination of high maximum and high minimum temperatures has been thought to inhibit adequate body cooling, therefore, the number of heat-associated deaths tend to increase during these months.

OBJECTIVE

The purpose of this study is to investigate the relationship between environmental heat and mortality in Maricopa County, Arizona in order to determine the association between daily maximum and minimum temperatures and attributed deaths.

METHODOLOGY

Study Design

- Data Sources:
  - Maricopa County Death Database - used keywords and ICD codes to identify HA deaths
  - National Weather Service Website - acquired minimum and maximum temperatures
- Inclusion Criteria:
  - Heat Associated deaths occurring in the months of June, July and August for years 2006-2013.

Statistical Analyses

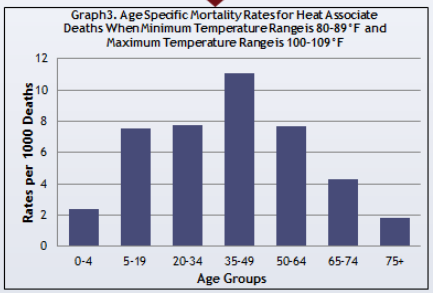
- Descriptive
  - Calculated the percentage of deaths among all MC deaths for the study period
  - Calculated the number of HA deaths in a given temperature range
  - Calculated Age Specific Mortality Rates and determined the characteristics for the most affected age
  - Identified the number of deaths occurring indoors and outdoors within the minimum and maximum temperature ranges to identify high risk activities
- Spearman's Correlation
  - Correlation coefficients were calculated between the number of deaths and the minimum and maximum temperature.
- Calculated Potential Years of Life Lost for all HA

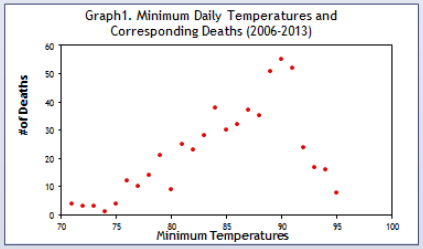
RESULTS

Table1. Temperature Range and Corresponding Deaths (2006-2013)

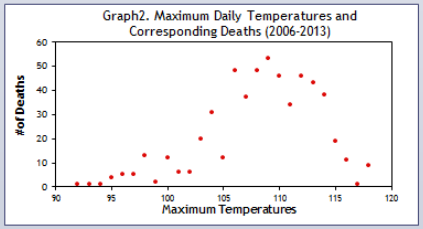
Minimum Temperature Range	*Total Number of Deaths*	*Percentage of Deaths*
71-79°F	72	13.0
80-89°F	308	56.0
90-96°F	172	31.0
Maximum Temperature Range	***Total Number of Deaths***	***Percentage of Deaths***
90-99°F	32	6.0
100-109°F	273	49.0
110-118°F	247	45.0

35% of deaths occurred when the minimum temperature range was 80-89°F and the maximum temperature range was 100-109°F.





Spearman's rho: 0.631, Degrees of Freedom:23, p-Value: 0.000712



Spearman's rho: 0.537, Degrees of Freedom:25, p-Value: 0.00388

Characteristics of 35-49 year olds

- This was the most affected age group when both the highest percentage of deaths within the minimum and maximum temperature ranges were considered
- The Age Specific Mortality rate is 11.0/1000 deaths
- Median age 45,(compared to 58 years old for all heat associated deaths), Mode is 49
- Potential Years of Life Lost is 32.9 (compared to 19.9 for all heat associated deaths)
- 83% of these heat associated deaths occurred outdoors
- Within this age group 24 (21%) have outdoor occupations and were outdoors when the death occurred; only 5 of these 24 are classified as occupational related deaths

CONCLUSION

- The summer months account for 88% of all Heat Associated deaths
- Both minimum and maximum temperatures are significantly correlated to the number of deaths:
  - Minimum Temperature p= 0.000712
  - Maximum Temperature p= 0.00388
- 56% of deaths occurred when the minimum temperature range was 80-89°F; 49% of deaths occurred when the maximum temperature range was 100-109°F
- when minimum and maximum temperature ranges are considered 35-49 year olds have the highest rate
  - We assumed that occupation might play a role in the rate
  - This accounts for roughly one-third of Potential Life Years being lost amongst these decedents

FUTURE ACTIONS

- Explore the relationship between daily average temperatures, humidity, and heat associated deaths.
- Expand the investigation to include heat related illness
- Further investigate the relationship between age groups and heat associated deaths
- Identify occupational and recreational activities at time of illness/death

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